



## Energy storage in Ohio and its potential to advance renewable energy

October 14, 2014

Cost-effective energy storage is frequently referred to as the “holy grail” of renewable energy. Electricity, as a commodity, is an instantaneous product that requires supply to precisely match demand at any given moment. Due to their intermittent nature, wind and solar resources are not always able to meet this demand. Effective storage of wind and solar energy would nullify this limitation, making renewable energy available at all times during the day.

The game-changing potential of cost-effective, large-scale energy storage goes beyond renewable energy benefits. Optimal energy storage can boost grid resiliency by enabling reserve electricity to be injected into the grid when most needed. Large-scale energy storage can also be utilized to provide electricity at peak times, thereby eliminating the need for new and expensive generation capacity that may be used infrequently.

In Ohio, the largest energy storage system is Dayton Power & Light’s array of 800,000 lithium-ion D-size batteries that store power when demand is low and provide extra power when demand is high within the PJM Interconnection, the regional grid that serves 60 million people. In a Dayton Daily News article, AES Energy Storage president Chris Shelton reports that the \$20 million AES battery array is the first advanced battery energy storage system in Ohio and one of the five largest in the world.” Shelton says the 40-megawatt system, launched in September 2013, has moved the entire industry forward to take storage seriously and include more of it as an alternative to power plants. According to a recent Dayton Daily News article, the facility’s parent company, AES Corp., contributed to a \$17 million increase in U.S. adjusted pre-tax contribution in the second quarter of 2014.

Another notable energy storage facility operated by RES Americas is located in Sunbury, Ohio. The system is comprised of a +/- 4MW (8MW total range)/ 2.6MWh lithium battery that provides frequency regulation to the PJM Interconnection system. The project consists of two containers that house batteries weighing approximately 20 tons each, as well as a third container that converts the direct current (DC) output to alternating current (AC) for injection and withdrawal of real power to and from the grid.

Ohio is also home to notable research and development in the area of energy storage. For example, researchers at the The Ohio State University (OSU) recently invented a battery that “could make solar energy more affordable for homeowners and businesses and could open the door for its widespread use as a sustainable power source,” according to a report by The Columbus Dispatch. Yiyang Wu, a chemistry and biochemistry professor at OSU and a member of the research group, said, “in order to use renewable energy, we have to use solar panels, but we have to save the energy, so then we also need to use batteries.” Wu and his students sought to integrate the battery and solar panel system into a single device. Existing systems “lose about 20 percent of the energy solar panels collect when the energy is transferred to a battery.” The system invented at OSU “maintains nearly all of the energy.” Mingzhe Yu, a doctoral student who invented a component of the new battery, said the OSU battery should lower solar-energy system manufacturing costs by around 25 percent.

OSU is also commercializing the KAIR Battery, a highly energy efficient and cost-effective potassium air battery for mass energy storage. According to KAIR, these batteries store generated electricity and return 98 percent of the input energy. Unlike competing products, KAIR’s batteries do not produce toxic byproducts at the end of their lifetime.<sup>1</sup> KAIR was the Grand Prize Winner of the Ohio State University Business Plan Competition and the recipient of the Energy Department’s Clean Energy Prize

from the Rice Business Plan Competition.<sup>2</sup>

Additionally, public policy changes are encouraging the development of cost-effective, large-scale energy storage. Last year, two orders from the Federal Energy Regulatory Commission (FERC), Order 792 and 784, elevated the importance of energy storage as part of the electric grid. Specifically, Order 792 added energy storage to the category of resources eligible to interconnect with the electric grid. With this approval by FERC, energy storage can receive rates, terms and conditions for interconnection with public utilities that are just, reasonable and nondiscriminatory. Order 784 requires PJM and other transmission providers to consider speed and accuracy when acquiring regulation resources, removes obstacles to selling such services at market-based rates and creates new accounting categories for tracking investments in electric storage.

Last year, California became the first state to adopt an energy storage mandate. Similar to Ohio's standards, which require utilities to achieve annual renewable and energy efficiency standards, California's mandate requires three major, investor-owned utilities to start increasing electric storage capacity on an annual basis. Under the mandate, the investor-owned utilities must achieve 1,325MW of storage by 2020. Currently, there is no proposed legislation in Ohio requiring the investor-owned utilities to provide energy storage capacity.

#### Footnotes

1. <http://energy.gov/national-clean-energy-business-plan-competition-2014/kair-battery>
2. Id.

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